

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

UNITED STATES OF AMERICA

- v. -

QINGZHOU WANG,
a/k/a “Bruce,” and
YIYI CHEN,
a/k/a “Chiron,”

Defendants.

S1 23 Cr. 302 (PGG)

**THE GOVERNMENT’S OPPOSITION TO
DEFENDANT QINGZHOU WANG’S MOTION *IN LIMINE*
TO PRECLUDE EXPERT TESTIMONY**

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PRELIMINARY STATEMENT

The Government respectfully submits this memorandum of law in opposition to defendant Qingzhou Wang's letter motion *in limine*, filed December 13, 2024, which seeks to preclude certain testimony regarding ortho-methylfentanyl by two of the Government's proposed experts, chemist Christine Herdman, Ph.D., and senior pharmacologist Luli Akinfiresoye, Ph.D. of the Drug Enforcement Administration ("DEA"), and, alternatively, to have the Court hold a hearing pursuant to *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993) ("Motion"). (Dkt. No. 93).¹ Wang challenges Dr. Herdman's and Dr. Akinfiresoye's proposed testimony regarding ortho-methylfentanyl, arguing that the testimony is: (1) not relevant or reliable under Rule 702 of the Federal Rules of Evidence; (2) irrelevant, unduly prejudicial, and confusing under Rules 401 and 403, respectively; and (3) appropriately precluded under Rule 704 because it amounts to testimony regarding Wang's mental state and intent. (Mot. at 2-5). As set forth below, the Government's proposed testimony of Dr. Herdman and Dr. Akinfiresoye regarding ortho-methylfentanyl is highly relevant and reliable, will not be unduly prejudicial or confusing to the jury, and will not include opinion on the mental state or intent of Wang or his co-defendant, Yiyi Chen. Accordingly, Wang's Motion should be denied.

¹ While Wang's Motion stated that the Government's Rule 16 disclosures for Dr. Akinfiresoye and Dr. Herdman were attached as Exhibits A and B, respectively, to the Motion, no such exhibits appear to have been filed with Wang's Motion. Accordingly, attached hereto as Exhibits A and B are the Government's Rule 16 disclosures for Dr. Akinfiresoye and Dr. Herdman, respectively.

BACKGROUND²

A. Precursor Shipments and Relevant Communications By Wang, Chen, and Yang

As set forth in Superseding Indictment S1 23 Cr. 302 (the “Indictment”) and Government’s December 13, 2024 Motions *In Limine* (Dkt. No. 92), and as the Government will prove at trial, from at least in or about November 2022 to in or about June 2023, defendant Hubei Amarvel Biotech Co., Ltd., a/k/a “AmarvelBio,” (“Amarvel Biotech”) and certain of its executives and employees, including trial defendants Wang and Chen, and defendant FNU LNU, a/k/a “Er Yang,” a/k/a “Anita” (“Yang,” and collectively with Amarvel Biotech, Wang, and Chen, the “Defendants”), shipped more than 200 kilograms of precursor chemicals used to make fentanyl and its analogues from China to the United States to DEA confidential sources posing as associates of a Mexico-based fentanyl trafficking operation with operations in the United States, including New York.

After negotiations between Yang and CS-1³ regarding an order of precursor chemicals — in which Yang repeatedly referenced the involvement of her “boss” (whom Yang later identified as Wang) and acknowledged that CS-1 was “making fentanyl” and would “be able to synthesize fentanyl” with the precursor chemicals in the order (Indictment ¶¶ 16, 18, 19)⁴ — Amarvel Biotech

² The Government incorporates by reference herein the “Factual Background” section of its memorandum of law in support of its December 13, 2024 Motions *In Limine* (“Government’s Memorandum”). (Dkt. No. 92). The Government assumes the Court’s familiarity with the facts set forth therein. The Government provides additional information here as relevant to the proposed expert testimony of Dr. Herman and Dr. Akinfiresoye.

³ Terms not otherwise defined herein shall have the meaning ascribed to them in the Government’s Memorandum.

⁴ Unless otherwise specified, in communications with the DEA confidential sources, Yang spoke in English, Wang spoke in Mandarin, and Chen spoke in both English and Mandarin and translated

(continued on next page)

shipped to New York in or about January 2023 approximately one kilogram of the fentanyl precursor 1-boc-4-AP, approximately one kilogram of the fentanyl precursor 1-boc-4-piperidone, and nearly 900 grams of the methamphetamine precursor methylamine (the “January 2023 Shipment”) (Indictment ¶ 20).⁵

During the later meeting in Bangkok on or about March 23, 2023, Wang and Chen discussed with CS-2 their ability to supply ton-quantities of fentanyl precursors to New York for CS-1 and CS-2’s fentanyl manufacturing operation. (Indictment ¶ 25). These discussions included reference to the formula used to make fentanyl. For example, when CS-2 asked for a different formula for manufacturing the “finished product,” stating that several American customers had purportedly died from what had been made from the January 2023 Shipment, Chen explained to Wang, in Mandarin, that “he [referring to CS-2] said the fentanyl he made was too, too, too strong, and some Americans, after consuming, consuming it, would die.” Wang responded to Chen, in Mandarin, in part: “You just tell him . . . I think it’s better not to make the product too concentrated”⁶ Wang and Chen discussed, in Mandarin, CS-2’s need for the “synthesis process and the formula” for manufacturing fentanyl, and Wang told Chen that “our current

between the two languages for Wang. In these communications, CS-1 and CS-2 (described below) spoke in English. In private conversations with each other, Yang, Chen, and Wang generally communicated in Mandarin. All communications are presented in substance and in part, and are based on draft transcriptions and (where necessary) English translations.

⁵ The Government has noticed the expert testimony of Matthew Sider, a DEA senior forensic chemist, who will testify as to the lab analysis he performed that identified these specific precursor chemicals in the January 2023 Shipment. Wang and Chen have not moved to preclude the proposed expert testimony of Mr. Sider.

⁶ Facts described without citation to the Indictment are based upon evidence produced in discovery in this case, including evidence recovered from Chen’s electronic devices. As noted above, communications are presented, where necessary, using draft English translations of the original Mandarin.

company policy is that, when there is a sufficient quantity in collaboration, regarding this, this formula, we can collaborate with him.” Wang added, in Mandarin, that they could transfer the “formula” using an application that would cause the formula to “disappear after it has been sent.”

After the meeting in Bangkok, CS-1 and CS-2 continued to discuss the fentanyl manufacturing operation — with further reference to a formula for fentanyl — in a group chat that included Yang, Wang, and Chen, and also through individual communications between Yang and CS-1 and CS-2. (Indictment ¶ 26). For example, on or about March 27, 2023, CS-2 wrote in the group chat that included Yang, Wang, and Chen: “Need formula for Best fentanyl . . . As we discussed im Bangkok.” Yang replied in the group chat: “Tomorrow I will complete the product form and send it to this group.” Later, on or about March 30, 2023, Yang wrote to CS-2, “piperidine is the best-selling product in Mexico, which is used to make fentanyl.” (Indictment ¶ 27). As another example, on or about April 4, 2023, Yang sent CS-1 the following chart identifying the “Raw Materials” or precursors (by Chemical Abstracts Service (“CAS”) number)⁷ needed to manufacture several controlled substances or “Final product[s],” as the chart states, including fentanyl (the “Final Product/Raw Materials Chart”):


⁷ As Dr. Herdman will explain, CAS registry numbers are unique, numerical identifiers for chemical substances. (*See* Ex. B at ¶4(b)).

Item No.	Final product	Main Raw Material	Auxiliary Raw Materials
1	4MMC	1451-82-7	74-89-5
			872-50-4
			7647-14-5
2	Amphetamine	5449-12-7	1310-73-2 132228-87-6
3	MDMA	28578-16-7	144-55-8
			1310-73-2
4	Fentanyl	125541-22-2	16940-66-2
			79-03-8
5	Scl-adba	109555-87-5	68-12-2
			584-08-7
			1119-6:44 AM

(Indictment ¶ 27).

During further discussions among Wang, Chen, Yang, and CS-2 regarding an order by CS-2 of approximately 200 kilograms of chemicals to make 50 to 55 kilograms of fentanyl, which CS-2 described as the “final product” (Indictment ¶ 28), Chen told Wang, in Mandarin, that CS-2 “said he wants to produce the final product weighing 50-55 kilograms and will provide us with a form specifying the raw materials he wants.” Wang replied, in Mandarin, “No problem.” When CS-2 asked how long it would take for the chemicals to arrive in New York, Wang told Chen, in Mandarin, “To New York . . . I need to look at his [order] form first. Once I see his form, I’ll check if we have stock in the warehouse.” On or about April 11, 2023, CS-2 sent messages in the group chat that included Wang, Chen, and Yang confirming an order for a total of 210 kilograms of fentanyl precursors, including 1-boc-4-AP. (Indictment ¶ 28). On or about April 12, 2023,

Yang responded in the group chat with an invoice bearing the letterhead of Amarvel Biotech, as shown below (the “Amarvel Invoice”):⁸

		HUBEI AMARVEL BIOTECH CO., LTD <div style="background-color: black; height: 20px; width: 100%;"></div>		
		W: http://www.amarvelbio.com/		
PROFORMA INVOICE				
Contact person:	Warehouse in USA near NY		Invoice No: AB03230413	
Address:			Date: 2023-4-12	
Phone number:				
Items	CAS No.	Unit price(USD)	Quantity(KG)	Total price(USD)
1-N-Boc-4-(Phenylamino)piperidine	125541-22-2	700	50	35000
Propionyl chloride	79-03-8	60	100	6000
(2-Bromoethyl)benzene	103-63-9	80	60	4800
CREDIT AMOUNT:			\$4,973	
BALANCE AMOUNT:			\$40,827	
Total AMOUNT:			\$45,800	
Seller's virtual currency account				
USDT ERC 20		<div style="background-color: black; height: 40px; width: 100%;"></div>		
USDT TRC 20				
BITCOIN				
Seller's bank information:				
Account Name:	Hubei Amarvel Biotech Co.Ltd			
Account Number:	<div style="background-color: black; height: 80px; width: 100%;"></div>			
Bank Name:				
Bank Address:				
Country/Region:				
SWIFT Code:				
Bank Code:				
Branch Code:				

(Indictment ¶ 28).

On or about May 2, 2023, after Yang notified CS-1 of the arrival of the above shipment (the “May 2023 Shipment”) at a warehouse in California, Yang explained in the group chat with CS-1, CS-2, Wang, and Chen that “New York, the United States, has been strict in checking the

⁸ 1-N-Boc-4-(Phenylamino)piperidine, as shown on the invoice, is also known as 1-boc-4-AP, a fentanyl precursor, as Dr. Herdman will explain (*see* Ex. B. at ¶¶ 4(c) and (d) & n.2), and a List I chemical regulated by the DEA. (2-Bromoethyl)benzene, as shown on the invoice, is also known as 2-Phenethyl bromide, discussed below.

precursors of the ‘final product’ some time ago, so for the sake of safety, this time it is sent to California.” (Indictment ¶ 30).

On or about May 5, 2023, the DEA, using another confidential source (“CS-3”), retrieved the shipment of precursor chemicals from the warehouse. A DEA laboratory determined that the shipment contained approximately 105.2 kilograms of propionyl chloride, approximately 67.97 kilograms of 2-Phenethyl bromide,⁹ and approximately 50.02 kilograms of ortho-Methyl-N-boc-4-AP.¹⁰

B. Dr. Herdman’s Proposed Testimony

On November 14, 2024, the Government provided Wang and Chen with notice, pursuant to Rule 16(a)(1)(G), regarding the proposed expert testimony of Dr. Herdman. (*See* Ex. B). Dr. Herdman received a Ph.D. in organic chemistry from Baylor University in 2016. Since then, Dr. Herdman has worked as a post-doctoral fellow with the National Institutes of Health and as a professional chemist with the DEA. Dr. Herdman has published extensively in chemistry, and she has testified as an expert in other federal criminal trials, including two trials involving fentanyl analogues before Judge Halpern in this District. *See United States v. Aziz*, 21 Cr. 113 (PMH) (S.D.N.Y. 2024); *United States v. Frazer*, 22 Cr. 665 (PMH) (S.D.N.Y. 2023).

As set forth in the notice, Dr. Herdman will testify, in part, as to the following: (i) fentanyl and methamphetamine are synthetic drugs; (ii) synthetic drugs can be manufactured using precursor chemicals, which are often identified by CAS number and which may not necessarily be

⁹ As noted above, 2-Phenethyl bromide is also known as (2-Bromoethyl)benzene, the chemical shown on the invoice.

¹⁰ The Government has noticed the excerpt testimony of Fracia Martinez, a DEA senior forensic chemist, who will testify as to the lab analysis she performed that identified the specific chemicals in the May 2023 Shipment. Wang and Chen have not moved to preclude the proposed expert testimony of Ms. Martinez.

drugs themselves but can be chemically combined or converted to manufacture certain drugs; (iii) methylamine (i.e., one of the chemicals identified by Mr. Martinez in the January 2023 Shipment) can be used to manufacture methamphetamine; (iv) 1-boc-4-AP (i.e., one of the chemicals identified in the January 2023 Shipment and listed on the Final Product/Raw Materials Chart under fentanyl as well as on the Amarvel Invoice) can be used to manufacture fentanyl; and (v) 1-boc-4-piperidone (i.e., one of the chemicals identified in the January 2023 Shipment) can be used to manufacture fentanyl. (*See* Ex. B. at ¶¶ 4(a), (b), and (c)). Dr. Herdman will further testify, in part, that certain of the “Raw Materials” listed in the Final Product/Raw Materials Chart could serve as a precursor for the their corresponding “Final product” in the chart and that the chemicals listed in the Amarvel Biotech Invoice are in fact precursors for fentanyl. (*Id.* at ¶¶ 4(d) and (e)).

In addition, Dr. Herdman will explain to the jury that, in chemistry, an analogue is a chemical compound that is similar in chemical structure to another chemical compound. (*Id.* ¶ 4(f)). Dr. Herdman will testify that ortho-Methyl-N-boc-4-AP (i.e., one of the chemicals identified by Ms. Martinez in the May 2023 Shipment) (i) is substantially similar in chemical structure to 1-boc-4-AP; (ii) is a precursor chemical for ortho-methylfentanyl; and (iii) in combination with propionyl chloride and (2-bromoethyl)benzene (i.e., the other two chemicals listed on the Amarvel Biotech Invoice and later identified in the May 2023 Shipment), can be used to make ortho-methylfentanyl. (*Id.* at ¶¶ 4(h) and (i)). Dr. Herdman will explain that ortho-methylfentanyl is a chemical compound that is substantially similar in chemical structure to fentanyl and is structurally related to fentanyl in that it has a particular modification to one part of the chemical structure. (*Id.* at ¶¶ 4(j) and (k)).

Dr. Herdman’s opinions are based on her extensive knowledge, skill, experience, training, and education in chemistry, as set forth in part above and detailed in her curriculum vitae (“CV”).

C. Dr. Akinfiresoye's Proposed Testimony

On November 8, 2024, the Government provided Wang and Chen with notice, pursuant to Rule 16(a)(1)(G), regarding the proposed expert testimony of Dr. Akinfiresoye. (*See* Ex. A). Dr. Akinfiresoye received a Ph.D. in pharmacology from Howard University in 2013. From 2013 to 2015, Dr. Akinfiresoye worked as a post-doctoral fellow at Georgetown University Medical Center as well as a scientific research program manager in Howard University College of Medicine's Department of Pharmacology in 2015. Since 2015, Dr. Akinfiresoye has served as a pharmacologist in the Drug and Chemical Evaluation Section of the Diversion Control Division of the DEA. She has also taught as an adjunct professor in pharmacology at Northern Virginia Community College since 2011. Dr. Akinfiresoye has published extensively in pharmacology, including on fentanyl-related substances.

As set forth in the notice, Dr. Akinfiresoye will testify, in part, as to the following: (i) both ortho-methylfentanyl and fentanyl are synthetic opioids of the structural class of substances known as the "4-anilidopiperidine" structural class; (ii) an opioid analgesic, such as fentanyl, predominantly interacts with and activates particular receptors in the central nervous system and other tissues known as mu-opioid receptors, acting as an agonist at these receptors; (iii) ortho-methylfentanyl, also preferentially binds to and activates the same mu-opioid receptors as fentanyl, and, like fentanyl, also acts as an agonist at these receptors; (iv) fentanyl and ortho-methylfentanyl produce a similar opioid receptor-mediated analgesic effect. (*See* Ex. A at ¶¶ 1-4). Dr. Akinfiresoye will explain that, overall, ortho-methylfentanyl and fentanyl are "equipotent" as opioid analgesics, meaning that, as pharmacological data indicates, ortho-methylfentanyl has a similar depressant effect on the central nervous system as fentanyl. (*Id.* at ¶¶ 4, 6).

Dr. Akinfiresoye's opinions are based on her extensive knowledge, skill, experience, training, and education in pharmacology, as set forth in part above and detailed in her CV, as well

as from her review of both *in vitro* and *in vivo* pharmacological studies regarding ortho-methylfentanyl and fentanyl.

LEGAL STANDARD

“An expert may be permitted to testify if he or she ‘is qualified, reliable, and helpful.’” *United States v. Kaufman*, No. 19 Cr. 504 (LAK), 2021 WL 4084523, at *18 (S.D.N.Y. Sept. 8, 2021) (citing *United States v. Gatto*, 986 F.3d 104, 117 (2d Cir. 2021), and Fed. R. Evid. 702).¹¹ “The inquiry is ‘guided’ by Federal Rule of Evidence 702,” *id.*, which provides that a “witness who is qualified as an expert by knowledge, skill, experience, training, or education” may offer an opinion if “the expert’s scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue,” and the testimony is the product of reliable facts and methods that the expert has “reliably applied” to the case, Fed. R. Evid. 702. District courts play a “gatekeeping role” to “ensur[e] that an expert’s testimony both rests on a reliable foundation and is relevant to the task at hand.” *Daubert v. Merrell Dow Pharms.*, 509 U.S. 579, 597 (1993). “[T]he proponent of expert testimony has the burden of establishing by a preponderance of the evidence that the admissibility requirements of Rule 702 are satisfied.” *United States v. Williams*, 506 F.3d 151, 160 (2d Cir. 2007).

The first requirement — that the expert’s “scientific, technical or other specified knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue” — serves a dual purpose. *In re Rezulin Prods. Liability Litig.*, 309 F. Supp. 2d 531, 539 (S.D.N.Y. 2004) First, “[i]n requiring that expert testimony be directed to ‘scientific, technical, or specialized’ knowledge,” the requirement “ensures that expert witnesses will not testify about lay

¹¹ Unless otherwise specified, all case quotations omit internal quotation marks, citations, and prior alterations.

matters” that are properly left for the jury, such as “facts or opinions stated by other potential witnesses” or “interpretations of conduct or views as to the motivation of parties.” *In re Rezulin Prods. Liability Litig.*, 309 F. Supp. 2d at 541, 546. Second, even testimony that is properly based on scientific, technical, or specified knowledge must “‘fit’ . . . the facts of the case.” *City of Provid., R.I. v. Bats Glob. Mkts.*, No. 14 Civ. 2811 (JMF), 2022 WL 902402, at *8 (S.D.N.Y. Mar. 28, 2022). This requires the expert testimony to stay in bounds: The testimony must be directly pertinent to an issue that the jury has to resolve, but it must not “usurp either the role of the trial judge in instructing the jury as to the applicable law or the role of the jury in applying that law to the facts before it.” *United States v. Lumpkin*, 192 F.3d 280, 289 (2d Cir. 1999); *accord In re Rezulin Prods. Liability Litig.*, 309 F. Supp. 2d at 541.

Rule 702 also requires that the proffered expert testimony be “the product of reliable principles and methods” that are “reliably applied . . . to the facts of the case.” Fed. R. Evid. 702. In *Daubert*, the Supreme Court set out a list of non-exclusive factors that the trial court may consider in determining whether an expert’s reasoning or methodology is reliable: (1) whether the theory or technique used by the expert can be, or has been, tested; (2) whether the theory or technique has been subjected to peer review or publication; (3) the known or potential rate of error of the method used; (4) whether there are standards controlling the technique’s operation; and (5) whether the theory or method has been generally accepted within the relevant scientific community. *Daubert*, 509 U.S. at 593-94. The Court is not required “to admit opinion evidence that is connected to [the facts] only by the *ipse dixit* of the expert.” *Gen. Elec. Co. v. Joiner*, 522 U.S. 136, 146 (1997). “[W]hen an expert opinion is based on data, a methodology, or studies that are simply inadequate to support the conclusions reached, *Daubert* and Rule 702 mandate the

exclusion of that unreliable opinion testimony.” *Amorgianos v. National Railroad Passenger Corp.*, 303 F.3d 256, 266 (2d Cir. 2002).

“The Rules of Evidence provide a liberal standard for the admissibility of expert testimony,” *United States v. Dukagjini*, 326 F.3d 45, 52 (2d Cir. 2003), and the Second Circuit has held numerous times that expert testimony can be helpful to inform the jury about concepts involved in the trial that are “beyond the ken of the average juror,” *United States v. Amuso*, 21 F.3d 1251, 1263 (2d Cir. 1994). This standard requires a “common sense inquiry into whether the untrained layman would be qualified to determine intelligently and to the best possible degree the particular issue without enlightenment from those having a specialized understanding of the subject involved in the dispute.” *United States v. Locascio*, 6 F.3d 924, 936 (2d Cir. 1993). Undoubtedly, “[e]xpert witnesses are often uniquely qualified in guiding the trier of fact through a complicated morass of obscure terms and concepts,” and “[b]ecause of their specialized knowledge, their testimony can be extremely valuable and probative.” *United States v. Duncan*, 42 F.3d 97, 101 (2d Cir. 1994).

Expert testimony may also be excluded under Federal Rules of Evidence 401, 402, and 403 if it is irrelevant or if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury. Rule 403 has a “uniquely important role . . . in a district court’s scrutiny of expert testimony, given the unique weight such evidence may have in a jury’s deliberations.” *Nimely v. City of New York*, 414 F.3d 381, 397 (2d Cir. 2005). To assess whether expert testimony is relevant, the district court must consider whether the evidence has “any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence.” *Amorgianos*, 303 F.3d at 265.

ARGUMENT

The Government’s Proposed Expert Testimony Regarding Ortho-Methylfentanyl Is Admissible

Wang seeks to preclude “any expert testimony regarding ortho-methylfentanyl” by Dr. Herdman and Dr. Akinfiresoye. (Mot. at 2). As set forth below, this expert testimony is highly relevant and admissible under Rule 702, and Wang’s objections are without merit.

A. The Proposed Expert Testimony Is Admissible Under Rule 702

Wang first contends that, because “[n]owhere is it alleged that ortho-Methylfentanyl was ever seized, shipped to, or received in the United States,” the proposed expert testimony regarding ortho-methylfentanyl will be based on “a theoretical understanding disconnect[ed] from the facts, substances, and data in this case” and therefore is not admissible under Rule 702. (Mot. at 2). Wang mischaracterizes the charges and ignores key evidence and facts that will be presented to the jury.

Count One of the Indictment charges Wang and Chen with conspiring to manufacture, distribute, possess with intent to manufacture, and possess with intent to distribute two types of controlled substances: fentanyl *and* a fentanyl-related substance, in violation of Title 21, Code of Federal Regulations, Section 1308.11(h)(30)(i), and Title 21, United States Code, Section 841(b)(1)(A).¹² The fentanyl-related substance that Wang and Chen conspired to manufacture, distribute, possess with intent to manufacture, and possess with intent to distribute is ortho-methylfentanyl. The Government will prove at trial that Wang and Chen (and their co-

¹² As set forth in the Government’s requests to charge, the Government does not intend to proceed on a theory of liability under the Controlled Substance Analogue Enforcement Act, 21 U.S.C. §§ 802(32) and 813. To be clear, however, the Government will establish at trial that the fentanyl-related substance in this case (ortho-methylfentanyl) is an “analogue of [fentanyl]” under the plain meaning of the term, *see United States v. McCray*, 7 F.4th 40 (2d Cir. 2021), and therefore triggers the 10-year mandatory minimum set forth in 21 U.S.C. § 841(b)(1)(A)(vi).

conspirators) agreed to manufacture and distribute fentanyl and ortho-methylfentanyl in the United States by supplying precursor chemicals for those drugs. The Government's proof at trial will include, among other things, the conspirators' January 2023 Shipment (which included the fentanyl precursor 1-boc-4-AP) and May 2023 Shipment (which included the ortho-methylfentanyl precursor orth-Methyl-N-boc-4-AP). As relevant to Wang's challenge to expert testimony regarding ortho-methylfentanyl, Dr. Herdman will explain to the jury (1) the chemical nature of the precursors delivered in the May 2023 Shipment, including ortho-Methyl-N-boc-4-AP's chemical similarity to 1-boc-4-AP, a fentanyl precursor; (2) how the chemicals delivered in the May 2023 Shipment, including ortho-Methyl-N-boc-4-AP, could be used to make ortho-methylfentanyl; and (3) the chemical nature of ortho-methylfentanyl, including its chemical similarity to fentanyl. Dr. Akinfiresoye, in turn, will explain the pharmacological effect of ortho-methylfentanyl, including its equal potency to fentanyl as an opioid.

This expert evidence is plainly helpful to the jury in understanding what the conspirators *did* because it explains the significance of the chemicals they delivered in May 2023. This expert evidence is also helpful to the jury in determining whether the defendants intended to make fentanyl or ortho-methylfentanyl, because it explains how the chemicals they delivered in May 2023 could be used to make ortho-methylfentanyl and how similar ortho-methylfentanyl is to fentanyl. And this expert evidence is helpful to the jury in determining whether ortho-methylfentanyl is in fact a "fentanyl-related substance," 21 C.F.R. § 1308.11(h)(30)(i), and an "analogue of [fentanyl]," 18 U.S.C. § 841(b)(1)(A)(vi), both of which are defined by chemical similarity to fentanyl, *see* 21 C.F.R. § 1308.11(h)(30)(i); *McCray*, 7 F.4th at 45–47. There can be no serious dispute that this evidence requires "scientific, technical, or other specialized knowledge" that average jurors do not possess, but will undoubtedly help the jury to "understand the evidence"

and “to determine a fact in issue.” Fed. R. Evid. 702; *see also In re Methyl Tertiary Butyl Ether (MTBE) Prod. Liab. Litig.*, 643 F. Supp. 2d 482, 504 (S.D.N.Y. 2009) (“Expert witnesses provide laymen with crucial knowledge where the common experience of such jurors is insufficient to comprehend particular facts of a case.”).

Turning more specifically to Wang’s challenges, Dr. Herman’s proposed expert testimony that the ortho-Methyl-N-boc-4-AP identified in the May 2023 Shipment, when combined with the other precursor chemicals in that shipment, can be used to manufacture ortho-methylfentanyl plainly is admissible under Rule 702. Wang’s unsupported assertion that such testimony is speculative and that Dr. Herdman “has no lab experience to support this conclusion” (Mot. at 3), ignores that Dr. Herdman holds a doctorate in organic chemistry, specializing in “organic synthesis” and “drug design and synthesis,” among other things, and has worked for the DEA as a chemist since 2018 similarly focusing on, in part, “synthetic methodologies” (*see* Ex. B). There is no requirement that an expert personally perform a chemical synthesis in a laboratory before testifying that such a synthesis is possible. *Cf. O2 Micro Int’l Ltd. v. Monolithic Power Sys., Inc.*, 420 F. Supp. 2d 1070, 1088 (N.D. Cal. 2006) (“an expert is not required to testify only upon data the expert has personally gathered or tested” (citing Fed. R. Evid. 703)), *aff’d*, 221 F. App’x 996 (Fed. Cir. 2007). Likewise, Wang’s contention that Dr. Herdman’s opinion amounts to an attempt “to link an impossible hypothetical to a legally significant analogue substance designation[] when none exists” falls flat. (Mot. at 3). Dr. Herdman’s proposed expert testimony as to the chemical structure of ortho-methylfentanyl and how it varies from that of fentanyl “is directly pertinent to an issue that the jury has to resolve,” *Lumpkin*, 192 F.3d at 289 — that is, whether ortho-methylfentanyl is a controlled substance. Count One alleges as part of the object of the conspiracy the manufacture of a “fentanyl-related substance,” as defined under 21 C.F.R. § 1308.11(h)(30)(i),

which requires the chemical structure of the substance to vary from that of fentanyl in only a set number of ways. As relevant here, one of those specified ways is “[r]eplacement of the aniline ring [of fentanyl] with any aromatic monocycle whether or not further substituted in or on the aromatic monocycle.”¹³ If a substance is structurally related to fentanyl in this way, then it is a fentanyl-related substance, and therefore a controlled substance. Moreover, the jury will be required to determine whether ortho-methylfentanyl is similar in chemical structure to fentanyl in order to decide whether Count One involved an analogue of fentanyl, thereby triggering the penalty provision of 21 U.S.C. § 841(b)(1)(A)(vi). *See McCray*, 7 F.4th at 45–47. The precise way in which ortho-methylfentanyl in fact varies from the chemical structure of fentanyl, and whether it is in the specific ways set forth by law, is well “beyond the ken of the average juror.” *Amuso*, 21 F.3d at 1263. Dr. Herdman’s proposed testimony in that regard that will undoubtedly aid the jury.

Likewise, Dr. Akinfiresoye’s proposed expert testimony regarding the similar pharmacological effects of ortho-methylfentanyl and fentanyl, and specifically that both are “equipotent,” is admissible under Rule 702. It is testimony that “fit[s] the facts of the case,” *City of Provid.*, 2022 WL 902402, at *8, and will aid the jury in understanding certain evidence. Here, as described above, Wang and Chen discussed with CS-2 during the meeting in Bangkok the potency of the “final product” made from the January 2023 shipment of fentanyl precursors, with CS-2 telling them, as Chen recounted it to Wang, that “the fentanyl he made was too, too, too strong, and some Americans, after consuming, consuming it, would die.” There was also discussion between the Confidential Sources and Yang, Wang, and Chen regarding the Confidential Sources obtaining a formula for manufacturing fentanyl, both in Bangkok in

¹³ The aniline ring is a specific region in the chemical structure of fentanyl. *See* DEA, “Fentanyl-Related Substances,” *available at* https://www.deadiversion.usdoj.gov/drug_chem_info/frs.pdf (Dec. 2024).

connection with the potency of the “final product” and in the lead up to the May 2023 Shipment, which, as reflected in the communications in April 2023 and on the Amarvel Invoice, was supposed to include 1-boc-4-AP, the precursor used to make fentanyl. Dr. Akinfiresoye’s proposed testimony will help the jury better understand how what the May 2023 Shipment contained instead — i.e., the ortho-methyl-N-boc-4-AP precursor chemical — could still be used to manufacture a “final product” — i.e., ortho-methylfentanyl — that closely resembled fentanyl not only in chemical structure but in potency and similar effect on the end user as fentanyl.

In this regard, Wang’s contention that “[w]ithout any ortho-Methylfentanyl, there are simply no underlying facts at issue to apply the expert reasoning as to pharmacological effect and chemical properties” is without merit. (Mot. at 3). The relevant underlying fact is that the defendants and their co-conspirators shipped a precursor to ortho-methylfentanyl in the May 2023 Shipment. Equally meritless is Wang’s attack that Dr. Akinfiresoye’s proposed testimony regarding the pharmacological effects of orthyl-methylfentanyl is “merely hypothetical and speculative.” (Mot. at 3). Dr. Akinfiresoye cites her review of both *in vitro* and *in vivo* studies as to such effects as the bases for her opinion.

Accordingly, the proposed expert testimony of Dr. Herdman and Dr. Akinfiresoye is plainly admissible under Rule 702.

B. Wang’s Rule 401 and Rule 403 Objections Are Meritless

The probative value of the proposed expert testimony of Dr. Herdman and Dr. Akinfiresoye far outweighs any potential danger of unfair prejudice or confusion. Here, Wang repeats the same overall relevancy objection as discussed above — i.e., that because there was no evidence or allegation that ortho-methylfentanyl was ever manufactured, possessed, or distributed — any testimony regarding its effect or related precursor chemicals has no probative value and will only confuse the jury. (Mot. at 4). This is unavailing for the same reasons discussed above regarding

admissibility under Rule 702. Moreover, to bolster his argument, Wang proceeds to inject into Dr. Akinfiresoye's proposed testimony a litany of graphic anatomical effects and harms of fentanyl that are not actually included in Dr. Akinfiresoye's Rule 16 disclosure: "Akinfiresoye's testimony, when translated into common language, may include such inflammatory effects as suffocation, lack of oxygen to the brain leading to coma, permanent brain damage, and death." (Mot. at 4). As evidenced by her Rule 16 disclosure, Dr. Akinfiresoye's testimony will describe narrowly how both fentanyl and ortho-methylfentanyl are equipotent and have a similar depressant effect on the central nervous system, or more specifically, a "similar opioid receptor mediated analgesic effect." (See Ex. A). That is the crux of Dr. Akinfiresoye's proposed testimony, not the litany of anatomical horrors that Wang reads into it. Consequently, Wang's Rule 403 argument is pure conjecture and unavailing.

C. Neither Dr. Herdman Nor Dr. Akinfiresoye Will Testify as to Wang or Chen's Mental State or Intent

Wang next contends that the Government would have Dr. Akinfiresoye and Dr. Herdman "speak to the defendant's mental state by imputing the knowledge of the pharmacological effect and chemical composition" onto the defendants and "backdoor" their "intent through expert testimony" — all in violation of Rule 704's preclusion of expert testimony on whether a defendant had to the requisite mental state or intent to commit the charged crimes. (Mot. at 4-5). Again, Wang injects and reads into the Government's Rule 16 disclosures for Dr. Herdman and Dr. Akinfiresoye far more than they contain. Nowhere do they assert, nor does the Government intend to elicit from either expert, any statement of Wang or Chen's mental state or intent regarding ortho-methylfentanyl. Indeed, the proposed expert testimony of both Dr. Herdman and Dr. Akinfiresoye, as set forth in their Rule 16 disclosures, appropriately leaves for the jury any "interpretations of

